WHAT IS CLAIMED IS:

1. A parallel round-robin arbiter (PRAA) for arbitrating among N requesting entities (requesters), comprising:

a first plurality of leaf nodes coupled together in a directed ring, each leaf node operating to propagate a request from a corresponding requester, wherein said directed ring forms a leaf level in a hierarchical decision tree having $[(\log_{Base}N)+1]$ levels, where $N = [Base]^n$ for some $n > 1$;

a second plurality of nodes organized in a subtree having $[\log_{Base}N]$ levels of said hierarchical decision tree, wherein a root level includes a root node and a sub-plurality of intermediate levels each including $[Base]^i$ internal nodes, where $i = 1, 2, \ldots, [(\log_{Base}N)-1]$; and

logic associated with said subtree's nodes for hierarchically resolving requests propagated by said leaf nodes, wherein each leaf node is operable to transmit its grant to one of its immediate leaf node neighbors coupled to it via said directed ring.

2. The parallel round-robin arbiter (PRAA) for arbitrating among N requesting entities as set forth in claim 1, wherein said Base is 3 and said hierarchical decision tree comprises a ternary tree.

3. The parallel round-robin arbiter (PRAA) for arbitrating among N requesting entities as set forth in claim 1, wherein said Base is 2 and said hierarchical decision tree comprises a binary tree.

4. The parallel round-robin arbiter (PRAA) for arbitrating among N requesting entities as set forth in claim 3, wherein said logic associated with an internal node on level L includes combinational circuitry operable to output a Request signal directed to its parent node on (L-1) level only if at least one leaf node belonging to a subtree portion rooted at said internal node has a request.

5. The parallel round-robin arbiter (PRAA) for arbitrating among N requesting entities as set forth in claim 4, wherein said logic associated with an internal node on level L includes combinational circuitry operable to output a Head signal indicative of a priority flag directed to its parent node on (L-1) level only if at least one leaf node belonging to a subtree portion rooted at said internal node propagates a signal indicative of said priority flag.

6. The parallel round-robin arbiter (PRAA) for arbitrating among N requesting entities as set forth in claim 5, wherein said logic associated with an internal node on level L includes combinational circuitry operable to output a Grant signal directed to its left child node on (L+1) level if the following conditions are satisfied: (i) there is a Grant signal from said internal node's parent node on level (L-1); (ii) there was a Request signal from said left child node to said internal node; and (iii) there was a Head signal from said left child node to said internal node.

7. The parallel round-robin arbiter (PRAA) for arbitrating among N requesting entities as set forth in claim 5, wherein said logic associated with an internal node on level L includes combinational circuitry operable to output a Grant signal directed to its left child node on (L+1) level if the following conditions are satisfied: (i) there is a Grant signal from said internal node's parent node on level (L-1); (ii) there was a Request signal from said left child node to said internal node; (iii) there was a Head signal from a right child node to said internal node, said right child node corresponding to said left child; and (iv) there was no Request signal from said right child node to said internal node.

8. The parallel round-robin arbiter (PRAA) for arbitrating among N requesting entities as set forth in claim 5, wherein said logic associated with an internal node on level L includes combinational circuitry operable to output a Grant signal directed to its right child node on (L+1) level if the following conditions are satisfied: (i) there is a Grant signal from said internal node's parent node on level (L-1); (ii) there was a Request signal from said right child node to said internal node; and (iii) there was a Head signal from said right child node to said internal node.

9. The parallel round-robin arbiter (PRAA) for arbitrating among N requesting entities as set forth in claim 5, wherein said logic associated with an internal node on level L includes combinational circuitry operable to output a Grant signal directed to its right child node on (L+1) level if the following conditions are satisfied: (i) there is a Grant signal from said internal node's parent node on level (L-1); (ii) there was a Request signal from said right child node to said internal node; (iii) there was a Head signal from a left child node to said internal node, said left child node corresponding to said right child node; and (iv) there was no Request signal from said left child node to said internal node.

10. The parallel round-robin arbiter (PRAA) for arbitrating among N requesting entities as set forth in claim 5, wherein said logic includes combinational circuitry associated with said root node on level 0, said combinational circuitry operating to output a Grant signal directed to its left child node on level 1 if the following conditions are satisfied: (i) there was a Request signal from said left child node to said root node; and (ii) there was a Head signal from said left child node to said root node.

11. The parallel round-robin arbiter (PRAA) for arbitrating among N requesting entities as set forth in claim 5, wherein said logic includes combinational circuitry associated with said root node on level 0, said combinational circuitry operating to output a Grant signal directed to its left child node on level 1 if the following conditions are satisfied: (i) there was a Head signal from a right child node to said root node, said right child node corresponding to said left child node; (ii) there was no Request signal from said right child node to said root node; and (iii) there was a Request signal from said left child node to said root node.

12. The parallel round-robin arbiter (PRAA) for arbitrating among N requesting entities as set forth in claim 5, wherein said logic includes combinational circuitry associated with said root node on level 0, said combinational circuitry operating to output a Grant signal directed to its right child node on level 1 if the following conditions are satisfied: (i) there was a Request signal from said right child node to said root node; and (ii) there was a Head signal from said right child node to said root node.

13. The parallel round-robin arbiter (PRAA) for arbitrating among N requesting entities as set forth in claim 5, wherein said logic includes combinational circuitry associated with said root node on level 0, said combinational circuitry operating to output a Grant signal directed to its right child node on level 1 if the following conditions are satisfied: (i) there was a Head signal from a left child node to said root node, said left child node corresponding to said right child node; (ii) there was no Request signal from said left child node to said root node; and (iii) there was a Request signal from said right child node to said root node.

14. A crossbar switch apparatus for switching a plurality (N) of input queues to at least one output, comprising:

means for receiving requests generated by said plurality of input queues; and

means for hierarchically resolving which input queue's request with respect to said at least one output should be granted,

wherein said means for receiving requests includes a plurality of leaf nodes that correspond to said plurality of input queues, each leaf node including means for influencing its neighboring leaf node's state if said leaf node receives a Grant signal responsive to a request generated by a corresponding input queue.

15. The crossbar switch apparatus for switching a plurality of input queues to at least one output as set forth in claim 14, wherein said means for hierarchically resolving which input queue's request with respect to said at least one output should be granted comprises a decision tree with said plurality of leaf nodes forming a leaf level.

16. The crossbar switch apparatus for switching a plurality of input queues to at least one output as set forth in claim 15, wherein said decision tree comprises $[\log_{Base}N]$ levels, where $N = [Base]^n$ for some $n > 1$.

17. The crossbar switch apparatus for switching a plurality of input queues to at least one output as set forth in claim 16, wherein said Base is 3 and said decision tree comprises a ternary tree.

18. The crossbar switch apparatus for switching a plurality of input queues to at least one output as set forth in claim 16, wherein said Base is 2 and said decision tree comprises a binary tree.

19. The crossbar switch apparatus for switching a plurality of input queues to at least one output as set forth in claim 18, wherein each of said plurality of leaf nodes includes a Reset-Set flip-flop element whose state is controlled by a Grant signal issued to a neighboring leaf node.

20. An arbitration method for resolving contention among a plurality of requesting entities (N requesters) with respect to at least one common resource, comprising:

receiving requests generated by said plurality of requesters, said requests being propagated by a plurality of leaf nodes corresponding to said plurality of requesters, wherein each leaf node is operable to transmit a control signal indicative of its priority status;

hierarchically resolving which requester's request with respect to said at least one common resource should be granted; and

generating, by a leaf node that receives a Grant signal, a control signal for transmission to its neighboring leaf node for affecting said neighboring leaf node's priority status.

21. The arbitration method for resolving contention among a plurality of requesting entities as set forth in claim 20, wherein said operation of hierarchically resolving which requester's request with respect to said at least one common resource should be granted is effectuated by a decision tree having a plurality of levels such that said plurality of leaf nodes form a leaf level.

22. The arbitration method for resolving contention among a plurality of requesting entities as set forth in claim 21, wherein said decision tree comprises a binary tree.

23. The arbitration method for resolving contention among a plurality of requesting entities as set forth in claim 21, wherein said plurality of leaf nodes are coupled together in a directed ring.

24. The arbitration method for resolving contention among a plurality of requesting entities as set forth in claim 21, wherein said decision tree comprises a ternary tree.